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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER

GUERRERO, MARIA F

ART UNIT

PAPER NUMBER

2822

DATE MAILED: 06/05/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/740,947

Applicant(s)

PARK ET AL.

Examiner

Maria Guerrero

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 21 December 2000.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-7 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-7 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s). _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s) <u>7</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

1. This Office Action is the First Action on the merits.

Claims 1-7 are pending.

Claim Objections

2. Claim 2 is objected to because of the following informalities: claim 2 recites "silicon nitride (SiN_x) and Si_3N_4 " on lines 4-5. Appropriate correction is required.

Specification

3. The lengthy specification has not been checked to the extent necessary to determine the presence of all possible minor errors. Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claim 7 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claim 7 recites forming a dielectric layer includes forming it only on an upper portion of the photodiode. The independent claim 1 recites forming a dielectric layer over the insulating layer. Claim 7 is vague and indefinite.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 1-2 and 4-6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Morimoto (U.S. 5,519,207) in view of Ino (U.S. 5,317,432).

6. Morimoto teaches providing a semiconductor-sensing device having a photodiode on a semiconductor substrate (Fig. 1(a)-1(b), col. 3, lines 50-67, col. 6, lines 5-10). Morimoto discloses forming an insulating layer covering the semiconductor structure including the photodiode (Fig. 1(a)-1(b), col. 3, lines 65-67, col. 6, lines 10-15, 20-25). Morimoto teaches forming a dielectric layer over the insulating layer and hydrogen annealing to reduce the dangling bonds (col. 2, lines 35-43, col. 5, lines 58-65, col. 6, lines 43-45).

Morimoto does not specifically teach diffusing hydrogen ions from the dielectric layer and removing the dielectric layer. However, Ino shows diffusing hydrogen ions from the dielectric layer and removing the dielectric layer by a dry etching process (Fig. 28, col. 15, lines 17-30). Ino also shows the dielectric layer being silicon nitride having a thickness of about 4000 angstroms (col. 15, lines 20-25).

Regarding the specific thickness claimed, it is considered to be obvious to a person of ordinary skill in the art to explore ranges out of the disclosed range because

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the range claimed it is not critical to the invention.” In *re* Woodruff, 919 F.2d 1575, 16 USPQ2d 1934 (Fed. Cir.1990). See also MPEP § 716.02 - § 716.02(g).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Morimoto reference by including the step of diffusing hydrogen ions from the dielectric layer and removing the dielectric layer by a dry etching process as taught Ino. The modification would provide a better annealing effect without generate difference in the dark current (Morimoto, col. 5, lines 60-65).

The recitation “fabricating a CMOS image sensor having a plurality of unit pixels” has not been given patentable weight because the recitation occurs in the preamble. A preamble is generally not accorded any patentable weight where it merely recites the purpose of a process or the intended use of a structure, and where the body of the claim does not depend on the preamble for completeness but, instead, the process steps or structural limitations are able to stand alone. See *In re Hirao*, 535 F.2d 67, 190 USPQ 15 (CCPA 1976) and *Kropa v. Robie*, 187 F.2d 150, 152, 88 USPQ 478, 481 (CCPA 1951).

Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Morimoto (U.S. 5,519,207) and Ino (U.S. 5,317,432) as applied to claims 1-2 and 4-6 above, and further in view of Ha (U.S. 5,401,685).

Regarding claim 3, the combination of Morimoto and Ino does not specifically show forming the dielectric layer by PECVD. However, Ha shows that the use of plasma enhanced chemical vapor deposition process (PECVD) is well known in the art (col. 1, lines 15-21).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time of the invention to modify the combination of Morimoto and Ino by employing PECVD process to deposit the silicon nitride layer as taught Ino because is well known in the art.

Conclusion

7. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Ishida et al. (U.S. 4,883,766), Ino (U.S. 6,556,257), Jung (U.S. 5,674,759), Kuhara (U.S. 5,483,096), Peek et al. (U.S. 6,448,592), and Tran et al. (U.S. 5,534,445) show the hydrogenation effect as well known in the art. Ballantine et al. (U.S. 6,271,054); Huang et al. "Improvement in Dark Current Characteristics and Long-Term Stability of Mesa INGAAS/InP pin Photodiodes with Two-Step SiNx Surface Passivation"; and Korde et al. "One Gigasrad Passivated Nitride Oxides for 100% Internal Quantum Efficiency Silicon Photodiodes" show a passivated photodiode structure.

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Maria Guerrero whose telephone number is 703-305-0162.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Amir Zarabian can be reached on 703-308-4905. The fax phone numbers for the organization where this application or proceeding is assigned are 703-308-7722 for regular communications and 703-308-7724 for After Final communications.

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Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

Maria Guerrero
Maria Guerrero
Patent examiner
May 29, 2003